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MAY 29 2003

TC 1700

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: El-Shoubary *et al.*

Examiner: Tae H. Yoon

Serial No.: 09 723,098

Group Art Unit: 1714

Filed: November 27, 2000

Docket: 13093

Title: *Organo-acid Phosphate Treated Pigments*

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May 21, 2003

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DECLARATION OF ROBERT J. KOSTELNIK, Ph.D.

Sir:

I, Dr. Robert J. Kostelnik, hereby declare that:

1. I received a B.S. degree in Chemistry from the University of Pittsburgh in 1968, and M.S. and Ph.D. degrees in Chemistry from Carnegie Mellon University in 1971 and 1972, respectively. During my career, I have acquired expertise in polymer characterization and pigment technology, as well as in the development of treated pigments for plastics and coatings applications.
2. I joined Millennium Inorganic Chemicals, Inc. in September 1993 as a Senior Scientist, and since that time, my primary job responsibility has been research and product development of titanium dioxide products.

3. I am one of the named inventors on the above-identified patent application.
4. I have read the Office Action dated March 4, 2003, and the patents and patent application cited by the Examiner: DE 1234234, McClain (US 4,287,333), Stramel (US 5,397,391), Menovcik (US 5,876,493), Yaginuma (US 3,920,769) and Orth-Gerber (US 6,340,387). I am familiar with the technology of the cited patents and patent application and understand the teachings expressed in those references. I am also familiar with the pending claims of the present application.
5. I have been asked to describe the effect that the inclusion of solvents would have on the compositions of the present invention and to comment on the Examiner's conclusions that the present invention is disclosed in and/or obvious in light of the cited art.
6. The claimed invention is directed to compositions that are particularly suited for thermoplastics applications. The embodiments that are reflected in the pending claims are directed to polymer matrices that contains either: (1) a pigimentary base that has been surface treated with an organo-acid phosphate compound and a polymer; or (2) a pigimentary base that has been surface treated with an organo-acid phosphate compound, a polymer, and at least one additional compound selected from the group consisting of metal oxides, polyalcohols and alkanolamines.
7. The exemplary polymers that are provided on page 7, lines 19 – 29 of the specification were selected because of their potential for use in thermoplastics applications.
8. In the compositions of the present invention, there is an essential absence of solvents or other volatile components. Examples 3-21 of the specification provide examples of these types of compositions.

9. The essential absence of a solvent or other volatile components is critical for thermoplastics applications. If one of ordinary skill in the art were to prepare a composition that comprises a pigment treated with the organo-acid phosphate composition of the present invention, a polymer, and a solvent or other volatile component, (regardless of whether any of the additional components as specified in claim 78 and its dependent claims are present,) the resulting composition would be ineffective in thermoplastics applications.
10. If solvents were included during manufacture of the polymer matrix, there would be problems of foaming, spitting and snapping, resulting in unusable thermoplastic compositions that contain voids. These problems are rooted in the properties that make solvents effective in applications other than thermoplastics applications.
11. The presence of a solvent in a composition used for a paint or coatings application is a requirement so that the paint is able to be applied at room temperature by brushing, rolling, spraying, *etc.* However, the presence of a solvent (even one that boils above the processing temperature of the thermoplastic composition) is detrimental in thermoplastics applications since lower viscosity would result in low melt strength and, hence, impaired processing of the thermoplastic composition.
12. Further, during processing for thermoplastics applications such as those in which the compositions of different embodiments of the present invention would be useful, most solvents and other volatile components that are typically used in paint applications would boil and/or evaporate. This attribute of solvents and other volatile compounds is another reason that they cause imperfections or holes in any film produced. These imperfections are commonly referred to as lacing. Prevention of lacing is a teaching of the claimed invention and cannot be accomplished if a solvent or other volatile component were present in the claimed thermoplastic polymer matrix compositions.

13. In addition to lacing, solvents can result in the formation of undesirable bubbles in the finished products. Thermoplastic polymer matrices are formed by melting a polymer to allow for manipulation of the polymer and the incorporation of pigments. The compositions that contain the polymer and pigment are processed at temperatures that are significantly higher than the temperatures at which solvents such as water and many organic solvents, boil or undergo rapid evaporation. In some cases, the thermoplastic polymer is processed at temperatures at which some organic solvents or other components undergo decomposition to volatile compounds. Thus, in addition to lacing as described in paragraph 12 above, if solvents or other volatile compounds were included during the thermoplastics processing steps, the resulting plastics products would contain bubbles when the solvent boils off or decomposes.
14. The evaporation during processing also poses safety hazards that include the potential explosive hazard of organic vapor, the emission of odorous compounds and as noted above, possibly the generation of decomposition products, if an organic solvent were used and a burn hazard, if an aqueous solvent were used.
15. Additional performance problems would be seen with different types of solvents. For example, if high boiling point organic solvents were used, the molten thermoplastic polymer composition would have lower viscosity, and hence, poor processibility due to reduced melt strength. If water were used, dispersion of the pigment during subsequent processing in any finished film would be extremely poor.
16. Accordingly, because the use of an organic solvent or water in connection with the components of the present invention would render the composition not useable in thermoplastics applications, their inclusion would materially change the characteristics of the compositions.

17. In deeming the pending claims unpatentable, the Examiner relies primarily on references that disclose compositions in which the use of a solvent is critical (DE 1234234 and Menoveik). Because the use of solvents in these references is critical, these references do not suggest to me that either of them alone or in combination with the other cited art suggest the present invention.
18. DE 1234234 teaches the use of dispersing a powder in an organic liquid, using acidic organic phosphorous compounds as dispersing agents. The organic solvents disclosed include benzene, toluene, xylene, petroleum ether, paraffin oil, methyl ethyl ketone, amyl acetate:acetone and acetone. See page 1 of translation of specification and Examples 3 – 6 of DE 1234234. Although Examples 5 and 6 also reference polyvinyl chloride and vinyl chloride – vinyl acetate copolymer, these polymers exist only in the presence of organic solvents and do not undergo high temperature processing characteristic of thermoplastic applications. The use of these organic solvents is critical for DE 1234234 because DE 1234234 is directed to use in paint applications, and without the solvent, one could not obtain a satisfactory product and apply the paint. Thus, by inclusion of a solvent, one can apply the paint with, *e.g.*, a brush. This is emphasized on page 2 of the translation, which provides: "Such dispersions are particularly suitable for making paint suspensions, because they can often significantly shorten the milling process to distribute the paint pigments in an organic liquid."
19. If one were to try to include these solvents in a thermoplastics application, the resulting product would be undesirable, because of the problems described in paragraphs 8-16 above, including the generation of potentially hazardous decomposition products. Thus, the presence of solvents would materially change the characteristics of the compositions of the present invention.

20. Because DE 1234234 discloses a composition that contains a pigment, a dispersant a polymer and a solvent in order to make it effective for paint applications, it does not suggest to me that its teachings would be applicable in applications that operate in the essential absence of a solvent and/or at elevated temperature, *e.g.*, thermoplastics applications.
21. The Examiner cites McClain for its disclosure of the use of polyethylene in a coating composition, and Stramel for its disclosure of polystyrene. He combines each of these references with DE 1234234 to assert that the present invention as reflected in certain claims is obvious. I respectfully assert that if one were to combine these references, one would not obtain the claimed invention, and there is nothing in these references that suggests to me that they should be combined.
22. If one were to combine these references, one would only be motivated to make a compound that includes the organic solvent of DE 1234234, which is distinct from the compositions of the present invention, which contains an essential absence of solvent. As noted in paragraphs 8-16 above, the inclusion of the solvent would materially alter the composition of the claimed invention, rendering it unusable for thermoplastic applications.
23. McClain is cited for its disclosure of polyethylene in a coating composition. It describes systems that are aqueous, and final compositions in which one may allow water to evaporate. Column 7, lines 12 - 21. However, if one were to combine McClain and DE 1234234, one would create a product that would contain the organic solvent that is critical in DE 1234234, and be left without direction as to whether to add water. This is a composition that is distinct from the present invention, which is essentially solvent free. Additionally, because DE 1234234 is directed to a system that contains an organic solvent, and McClain is directed to either a system that is aqueous or a composition from

which the water has evaporated, they describe alternative and difficult to reconcile conditions that are tailored to the specific applications. Because these are alternative conditions, there is no suggestion to combine the two references.

24. Further, with respect to Stramel, the compositions are essentially solvent free. Thus, if one were to combine Stramel with DE 1234234, one would produce a composition that contains an organic solvent (as required by DE 1234234). This is a composition that is distinct from the present invention, which is essentially solvent free. Additionally, because DE 1234234 is directed to a system that contains an organic solvent, and Stramel is directed to a system that is solvent free, they describe mutually exclusive conditions. Because these are mutually exclusive conditions, there is no suggestion to combine the two references.
25. Menovcik, the other reference on which the Examiner primarily relies, teaches pigments used in conjunction with a pigment treatment composition comprised of in one case a phosphate ester, an aminoplast resin and a solvent. Column 2, lines 6-11. This is distinct from the claimed invention that uses a phosphate ester alone. Further, in Menovcik, the phosphate ester is used for applications as a dispersant, not a treatment. Thus, it would not resist extraction, as would the treated pigments of the present invention. As described on page 5, lines 24 -29 of the present specification and the Extraction of Finished Pigments portion of the examples on pages 19 - 20, the claimed invention is directed at applications wherein the organo-acid phosphate treats the pigmentary base in such a way that it resists subsequent extraction. This is not the case in Menovcik. Thus, it does not form a treated pigment of the present invention.
26. Menovcik then teaches the incorporation of the pigment, preferably in the form of a dispersion, into an end use waterborne coating composition by combining with a principal resin. Column 4, lines 25-29. As with DE 1234234, the presence of a solvent

or water is critical because the solvent allows for the application of the composition as a liquid, by *e.g.* a brush. If one were to remove the solvent or water from the composition of Menoveik, one could not obtain a satisfactory product or apply it.

27. By contrast, if one were to try to include an aqueous solvent in a thermoplastics application, the solvent would render the product undesirable, causing the problems mentioned in paragraphs 8-16 above.
28. It is also noteworthy that Menoveik is directed to compositions that use liquid resins in waterborne coating compositions. The principle resins of Menoveik's coating compositions are liquid resins, and the water and solvent are needed to control the viscosity of the coating composition for its subsequent application to a substrate material. By contrast, the polymer matrix compositions of the claimed invention are prepared by combining the claimed treated pigment with a melted thermoplastic polymer at a temperature sufficiently high to melt the thermoplastic polymer. Because the polymer melt is formed at high temperatures, for the reasons described above, the inclusion of a solvent or water would impair the quality of the product, whereas it benefits the products of Menoveik.
29. Because Menoveik discloses a composition that contains a treated pigment, an aqueous solvent and a polymer, it does not suggest to me that its teachings would be applicable in applications that operate in the essential absence of a solvent or water.
30. The Examiner also cites McClain, Stramel, Yaginuma and Ortho-Gerber in combination with Menoveik.
31. As noted above Menoveik only suggests that its treated pigment may be useful in applications in which there is an aqueous media, thereby requiring the use of water as a

solvent.

32. The Examiner cites McClain as disclosing the use of polyethylene. However, even if one were to combine the polymer of McClain with the treated pigment of Menovcik, one would be led to try to produce a product in an aqueous media as suggested by Menovcik. This type of product is distinct from the present invention in which there is an essential absence of additional substances, including water. As noted above in paragraphs 8 -16, an aqueous system would materially alter the composition of the claimed invention, rendering it unusable for thermoplastics applications.
33. The Examiner cites Stramel as disclosing polystyrene. If one were to combine the polymer of Stramel with Menovcik, one would have a composition that contains an aqueous solvent as required by Menovcik. This type of product is distinct from the present invention in which there is an essential absence of a solvent. As noted above in paragraphs 8 -16, the presence of a solvent would materially alter the composition of the claimed invention, rendering it unusable for thermoplastics applications.
34. Further, Stramel and Menovcik provide for mutually exclusive conditions. Stramel discloses only solvent free systems, while Menovcik discloses a composition that exists in an aqueous system. Thus, there is no suggestion to combine the teachings of these two references.
35. The Examiner cites Yaginuma for disclosing the use of triethanolamine and Orth-Gerber for disclosing trimethylolpropane.
36. Yaginuma is directed at the use of amines and alkanolamines as neutralizing agents for neutralizing the reaction products of unsaturated carboxylic acids or anhydrides with polymers to make the reaction products more soluble in water. Column 3, lines 59-66

and column 4, lines 29 – 36. If one were to combine Yaginuma with any of the other cited references, one would be motivated to produce a product that exists in an aqueous system. This type of product is distinct from the present invention in which there is an essential absence of a solvent or water. As noted above in paragraphs 8 – 16, the presence of water would materially alter the composition of the claimed invention, rendering it unusable for thermoplastics applications.

37. The Examiner cites Orth-Gerber for disclosing trimethylolpropane. Orth-Gerber teaches the use of trimethylol propane as a grinding aid for jet milling and using the produced pigment in a water-thinable paint system. Column 4, lines 57 – 59 of Orth-Gerber. These systems exist in aqueous media. Thus, as with Yaginuma, if one were to combine this reference with any of the other cited references, one would be motivated to produce a product that exists in an aqueous system. This type of product is distinct from the present invention in which there is an essential absence of a water. As noted above in paragraphs 8 – 16, this would materially alter the composition of the claimed invention, rendering it unusable for thermoplastics applications.
38. In summary, I respectfully disagree with the Examiner's conclusions that the present invention is disclosed in any of the cited references or rendered obvious by any of the cited references, either alone or in combination. Most notably, the present invention is directed to applications in which there is an essential absence of a solvent, and the primary references on which the Examiner relies (DE 1234234 and Menoveik), as well as other of the references (Yaginuma and Orth-Gerber) require the use of a solvent. Thus, these references, either alone or in combination with the other cited art do not suggest the compositions of the present invention. Further, the inclusion of the solvent in the compositions of the present invention would fundamentally alter the characteristics of the present invention by yielding a product that could not be used for thermoplastics applications.

39. All statements made herein of my own knowledge are true, and all statements made on information and belief, are believed to be true. All statements are made with the knowledge that willful, false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

May 21, 2003

Date

Robert J. Kostelnik
Robert J. Kostelnik, Ph.D.